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The Role of Technology in Transforming Classroom Instruction: An Analysis of Blended Learning Approaches

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Abstract

This research explores how technology has changed teaching methods in the classroom through a blended learning approach. The research method used in this study is literature studies, which look for references appropriate to the research context. The study's findings suggest that technology can increase student engagement, facilitate access to a wider range of learning activities, and improve learning outcomes through more interactive and flexible methods. When strategically integrated into the learning process, technology improves teaching efficiency and prepares students with the skills needed for the digital age. The implications of these findings are important for education stakeholders in designing and implementing teaching practices that harness the potential of technology to improve the learning process in the classroom. Further research is suggested to conduct empirical studies involving experiments in real classrooms to measure the direct impact of technology and blended learning approaches on student engagement and learning outcomes.

Keywords Role; Technology; Teaching in the Classroom; Blended Learning

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1. INTRODUCTION

Technology has evolved throughout human history, playing a central role in advancing civilization and influencing every aspect of life, including the scope of education (Hawkridge, 2022). The scope of education is a concept that includes various aspects and elements involved in the educational process (Nickerson, 2013). Some of the aspects included in the scope of education include pupils or students, educational principles and objectives, and the educator himself. The foundation and objectives of education are the foundation of the educational activities carried out. On the other hand, educators provide instruction and guidance to students for educational purposes. All teaching and learning processes carried out by teachers are inseparable from technology (Budnyk 2016 et al., 2020)

Technology has become one of the main factors shaping the educational environment (M. Xiao et al., 2023). The educational environment is a system or space prepared for the learning and teaching process that includes various aspects such as physical infrastructure, resources, culture, and technology

that support educational activities. These environments can be in traditional classrooms, laboratories, libraries, or digital platforms such as virtual classrooms (Putra et al., 2023).

A conducive educational environment is essential for creating a learning atmosphere that stimulates, supports, and motivates students to reach their full potential (Abidova, 2023). Aspects that play a role in the educational environment include physical infrastructure, technology, learning resources, school culture, teaching methodologies, educational policies, support for special needs, and cooperation with parents and the community (Khoiruddin & Takhmid, 2024).

Creating an effective educational environment often requires collaborative initiatives between teachers, students, parents, and other stakeholders to create the most favorable learning conditions for student development jointly. So, with the advancement of information and communication technology, the field of education has undergone a wide transformation, from teaching methods to interactions between teachers and students (Williamson et al., 2023). Key aspects that mark technological developments in education such as digital learning resources and e-learning materials, virtual classrooms and distance learning, blended learning, adaptive and personalized learning tools, the use of mobile devices and applications, game-based learning and simulation, learning analytics and big data, virtual reality, and augmented reality, online collaboration tools, artificial intelligence (AI) in education, maker space and project-based learning (Martyniuk et al., 2022).

These technological developments offer new ways to facilitate learning and challenge educational institutions to continue to innovate and adapt their teaching practices. The development of the digital era has made it possible to use various tools and technology platforms that can support the learning process, making tool technology inseparable from modern teaching methodologies.

Modern teaching methodologies involve innovative teaching approaches that adapt to technological developments and the needs of today's students. One method that is considered effective is project-based learning, where students learn through research and responses to complex questions or problems. In addition, it is also important for teachers to increase student engagement and their ability to learn independently (Ergashevich, 2024).

The use of technology is also strongly emphasized in modern teaching methodologies. Teachers are expected to update their knowledge of the latest technologies relevant to education and integrate them into learning, for example, through interactive online platforms or digital educational tools (Ergashevich, 2024).

Students' technology skills are also in focus so they can leverage digital resources for their learning process, preparing them for a modern work environment that is increasingly dependent on technology. To effectively implement modern learning methods, teachers can attend training seminars and professional development programs that help them adapt to the latest learning trends and technology in education (Nanda Nur Rafiana, 2023).

Furthermore, in line with modern approaches, other innovative learning strategies include thought leadership, ongoing professional development, resource curation, curriculum development, and collaboration with various organizations as part of the development of modern pedagogy (Coutts et al., 2024; Khoiruddin & Takhmid, 2024). One of the increasingly popular learning approaches is blended learning, which combines traditional face-to-face teaching methods with online learning activities through digital technology (Nofirman et al., 2024). Blended Learning, also known as hybrid learning, is an educational approach that combines online materials and online interaction opportunities with traditional place-based class methods. This requires the physical presence of the teacher and the student, with some element of the student's control over time, place, route, or speed (Sedyh et al., 2024).

Blended learning is considered flexible and attractive, combining the benefits of face-to-face education with the convenience and capabilities of online learning technology (Widjaja & Aslan, 2022). This approach can effectively cater to different learning styles and facilitate a more personalized

learning experience. In its implementation, blended learning is effective in an educational environment. It is important to understand the approach's main characteristics, advantages, and challenges (G. Xiao & Zhang, 2024). Blended learning models can vary widely, but the main idea is to combine complementary face-to-face and online learning activities, enhancing the educational experience and offering a variety of ways for students to engage with the learning material and objectives (Asmawi et al., 2024). This approach is expected to combine the benefits of both learning methods, improving flexibility, student engagement, and overall learning outcomes.

Based on this background, this study aims to explore how technology has changed teaching methods in the classroom through a blended learning approach and its impact on student learning outcomes.

2. METHODS

The method used in this study is a literature study, namely by collecting, reviewing, and analyzing data that has been published through journal articles, books, research reports, and other reliable sources related to the use of technology in education in the context of blended learning (Ratislavová & Ratislav, 2014; Richardson, 2018). The methodological steps to be taken include: 1) Source identification: Determination of criteria for selecting relevant and credible sources, including the time frame of publication, research focus on educational technology, blended learning, and their impact on education. 2) Data collection: Using electronic library databases, journal databases, and academic platforms to collect relevant literature. 3) Evaluation of sources: Checking sources' credibility and relevance to the research topic and evaluating the quality of the research methodology presented in the literature. 4) Content analysis: Conduct a critical analysis of the data collected to extract information and findings related to the role of technology in education and the implementation of blended learning. 5) Presentation of findings: Organizing and presenting the results of literary analysis systematically, supported by valid arguments and evidence through various analyzed literature (Antin et al., 2015; Marshall et al., 2013).

3. FINDINGS AND DISCUSSIONS

Traditional Teaching with Blended Learning

Traditional teaching is an educational method that is usually teacher-centered and relies on one-way delivery of information from teachers to students. In this method, students are usually given information that they need to remember and repeat instead of having the opportunity to actively explore and understand the information (T. Kilag et al., 2023).

A commonly found traditional teaching method is a lecture by a teacher, where students passively listen and take notes on what the teacher explains. In addition, there is also a method of using textbooks as the main source of learning without using too much interactive media or advanced technology (Miramon, 2024). Although referred to as a traditional method, this teaching method has several advantages, such as a clear learning structure. It allows students to clearly understand what will be learned and expected (Venkateswaran et al., 2023).

Traditional learning is an approach in education that has special characteristics and has long been used in the education system. Pendekatan ini biasanya berfokus pada peran guru sebagai sumber utama informasi dan pengetahuan, dengan siswa bertindak sebagai penerima informasi (Gould, 2024).

The main features of traditional learning include: 1) Teacher-centric: Teachers play a major role in teaching and learning in traditional learning. Teachers convey information and knowledge directly to students through lectures or material exhibitions. 2) Students as Passive Recipients: Students tend to be

passive in learning. They are expected to listen, record, and remember the information provided by the teacher without much opportunity to participate or discuss actively. 3) Test-Based Assessment: Assessment of students' knowledge is often carried out through written exams or tests containing questions that measure their ability to remember and repeat the information taught. 4) Closed curriculum: The curriculum in traditional learning is usually set and set by educational authorities, with little room for teachers or students to adapt or explore topics beyond the prescribed material. 5) Using textbooks as primary sources: textbooks and other printed materials are the primary sources of information. Technology or other learning resources may be limited or not actively integrated into learning. 6) Individualist education: Traditional learning focuses more on individual student achievement than group work or collaborative learning (Gould, 2024). Although more interactive and student-centered learning approaches gradually replace traditional learning methods, they are still found in various educational contexts. Some educators and education systems may choose to combine traditional learning elements with modern learning methods to create a balanced learning environment (Chasteen, 2017)

Meanwhile, blended learning, or blended learning, is a formal education program that allows students to learn through content and instruction delivered online, having independent control over the time, place, sequence, or pace of learning (Suryono et al., 2023). This learning method is a mixed system that combines two components or methods at once, namely e-learning and multimedia learning (Chen et al., 2023).

In its practical context, blended learning relies on technology and combines online and face-to-face learning. Blended learning combines two educational models: traditional face-to-face and distance learning (Min & Yu, 2023). Mixed learning, or blended learning, is an educational approach that combines offline and online learning. This method combines the benefits of the two methods to create a more effective and flexible learning experience (Yasien et al., 2023).

The characteristics of blended learning are: 1) Offline learning: Students still need direct interaction with teachers in a classroom setting to explain complex concepts or topics, class discussions, and hands-on guidance. 2) Online learning: Some learning materials are taught online, such as through self-study modules, video lessons, quizzes, online discussions, and more. This allows students to learn at a time and place that is most convenient for them. 3) Digital and Personal Interaction: Blended learning allows students to interact with learning materials digitally while receiving direct guidance and support from teachers. 4) Flexibility: Blended learning allows students to learn anytime and from anywhere, as long as they can access the Internet. 5) Personalization: With blended learning, the learning materials and pace can be tailored to students' individual needs and preferences. 6) Use of Technology: Technology is crucial in blended learning. Technology can support online learning through e-learning platforms, learning applications, and social media (Albeta et al., 2023; Yasien et al., 2023).

Nonetheless, the implementation of blended learning can vary depending on various factors, such as the curriculum, student needs, and available resources. Effective implementation usually requires careful planning and adequate technical support. As such, Traditional Teaching and Blended Learning have some fundamental key differences in teaching methods, use of technology, and interaction between teachers and students. Blended learning offers a more flexible, dynamic, and adaptive approach compared to traditional teaching, using technology to enhance the learning experience and adapt to students' individual needs.

Technology and its Role in Education

Technology is the application of knowledge and skills to manipulate our environment and meet human needs and expectations. It usually involves using tools, machines, techniques, systems, or methods of processing materials in producing goods and services. Technology can include simple tools like pencils and paper and more complex tools like computers, drones, and satellites (Indrawati & Kuncoro, 2021).

Technology has touched almost every aspect of life, including education. Education, or education, is the process of facilitating learning or the acquisition of knowledge, skills, values, morals, beliefs, and habits. The educational process can occur through teaching, training, research, or practical experience. Education is limited to passively absorbing information and knowledge and involves the active process of critical thinking, problem-solving, and applying knowledge in real-life contexts (Fitria et al., 2024).

In a broader scope, education aims to enable individuals to develop fully in various aspects, including intellectual, social, physical, and emotional. Education seeks to equip individuals with the competencies necessary to become productive, ethical, and responsible citizens and to encourage lifelong learning (Abdumutalibovich & Lutfillaevna, 2023).

Education can occur in various settings, from formal settings such as schools, colleges, and universities to non-formal settings such as training programs, online courses, and self-paced learning. Education also includes various teaching and learning methods, using diverse teaching materials, and integrating technology to support learning.

Essentially, education serves as an essential tool in the personal development and social, economic, and cultural progress of society, providing a foundation for sustainable development and improving the quality of life of individuals and communities (Oybek & Asian, 2024).

The role of technology in education has evolved significantly, transforming from mere aid to a driver of pedagogical change. Technology has evolved from a tool to support the traditional learning process to a key enabler in redefining how we teach and learn. With the increasing access to the Internet and mobile devices, technology has become a core element in teaching, influencing not only logistics but also pedagogical philosophies and practices. Teachers today are using technology to improve teaching materials and as a primary means to facilitate a dynamic and student-centered learning experience (Oybek & Asian, 2024).

The role of technology in education includes: 1) Increasing access to learning resources. Technology has enabled access to a wide and diverse range of learning resources without being limited by space and time. Students can access learning materials, online courses, e-books, and other educational resources anywhere. 2) Personalization of learning. With technology, learning can be adjusted to each student's speed and learning style. This allows teachers to provide more customized material, giving students more control over their learning. 3) Enrich the Learning Experience. Technology enriches the learning experience with interactive media and tools such as educational games, simulations, and virtual reality (VR). This increases student engagement and facilitates the understanding of complex concepts. 4) Promote collaboration. Digital tools and platforms facilitate collaboration between students and teachers or even between students worldwide. Technology supports collaboration through forums, online group projects, and communication apps. 5) Facilitate evaluation and feedback. Technology provides various tools for instant assessment and feedback, which helps teachers monitor student progress more effectively. These include online quizzes, digital portfolio-based assessments, and a learning management system. (LMS). 6) Improving 21st century skills. Technology-based education supports the development of 21st-century skill

s such as problem-solving, critical thinking, information literacy, and digital skills. It is important to prepare students for the demands of the modern labor market. Technology has paved the way for distance and online learning, allowing students to access quality education in remote locations or with physical limitations. 8) Facilitate lifelong learning. With learning resources widely available on the Internet, technology supports lifelong learning. Adults and professionals can continue to learn and develop their abilities outside the formal education system (Oybek & Asian, 2024; Zheng et al., 2024).

From wider access to learning resources to 21st-century skill development, technology has changed the face of education. The integration of technology into education not only improves the quality of learning but prepares students for the future in the digital age.

Effectiveness of Blended Learning

Efficiency can generally be understood as the level of success in achieving a set goal. Efficiency emphasizes achieving desired outcomes and goals, not just the processes used. An organization or individual is considered effective if it can achieve its goals optimally. Efficiency is a measure of success. If an organization achieves its goals, it has worked effectively (Kusumastiti, 2024). Mixed learning is an educational approach that combines traditional instructional methods, such as face-to-face lectures, with online learning activities that use digital technology and internet resources (Nofirman et al., 2024).

The effectiveness of blended learning can be assessed based on several criteria, including: 1) Learning Outcome Achievement: Assesses whether a student achieves the targeted learning outcomes, including mastery of the material, application of knowledge, and critical skills. 2) Student engagement: Measure the level of student involvement and participation in the online and face-to-face learning process. 3) Learning personalization: Evaluating how well a blended learning approach can be tailored to each student's needs, interests, and learning level. 4) Flexibility and accessibility: Determine how students can access materials and participate in learning from different locations and times. 5) Quality of interaction: Checking the quality of interaction between students and teachers, students with learning materials, and students with each other. 6) Resource efficiency: Evaluating whether time, energy, and other resources are used most efficiently for educational purposes. 7) Improving Technology Skills: Measuring blended learning helps students and teachers improve technology skills. 8) Assessment Results: Viewing assessment results to determine whether students who study with blended methods score better than entirely face-to-face or online students. 9) Stakeholder Satisfaction: Assesses the level of satisfaction of students, teachers, and parents with a blended learning approach. 10) Quality of Learning Materials: Assessing the quality of learning materials used in blended learning, both online and offline (Manzanares et al., 2020; Sedyh et al., 2024).

The effectiveness of blended learning is often studied through empirical research involving experiments or surveys. This study proves that blended learning produces better results than other learning methods. The key to the success of blended learning lies in the right design, balanced integration between online and in-person components, and adequate support for students and teachers in the use of learning technologies.

Student Engagement in Blended Learning

Student involvement in learning is defined as a psychological process that involves attention, interest, and investment in learning activities, which emphasizes that psychological investment is the effort students make in the learning process and understanding for optimal learning outcomes. This involvement is closely related to educational success, suggesting that involvement related to school activities is key to achieving good educational outcomes (Pham & Vu, 2024).

Student involvement in blended learning shows how students actively and impactfully participate in the learning process, combining face-to-face and online learning. It involves not only the physical presence of students in the classroom but also their intellectual, emotional, and social involvement in all aspects of learning, both online and offline (Green et al., 2024).

The main aspects of student engagement in blended learning are 1) Intellectual involvement. Refers to how active students are in critical thinking, problem-solving, and integrating and applying new knowledge. Blended learning can be achieved through online discussions, research-based projects, or learning activities that require the application of the concepts learned. 2) Emotional engagement. Refers to how students feel regarding their learning experiences, including their motivation, ownership, and attachment to the learning material, teachers, and classmates. In blended learning, emotional engagement can be enhanced through quality interaction and feedback and engaging and relevant learning designs relevant to students' interests. 3) Social engagement. Demonstrate how well students are engaged in their learning community, both in-person and online. This includes participation in class

discussions, collaboration in group projects, and other social interactions that collectively allow for collective knowledge development. In blended learning, technology can facilitate spaces for students to connect and collaborate outside the confines of traditional classrooms. 4) Attendance engagement. Especially in blended learning, it is also important to consider attendance engagement, i.e., how effectively students manage their time and attendance between online and in-person learning environments. This includes staying engaged and productive while learning independently online and in an in-person classroom (Green et al., 2024; Moskalenko et al. Providing consistent feedback, using technology tools that support collaboration, and building a strong learning community are essential strategies for promoting deep engagement among students.

Learning Flexibility in Blended Learning

Learning Flexibility is a condition in which the learning and teaching process is increasingly free from time, place, and learning speed constraints. In learning, flexibility can include choices related to entry and exit points, the selection of learning activities, and assessment tasks. This scope is not only limited to these aspects. Still, it can also involve flexibility regarding time-space, learning at your own pace, changing learning strategies, and choosing learning resources and evaluation activities. (Pham, QH, & Vu, KP 2024).

In the context of blended learning, the concept of learning flexibility plays an important role in supporting the dynamics and diversification of the learning process. Blended learning, which combines traditional face-to-face and online learning elements, offers exceptional flexibility that can accommodate each student's diverse learning needs and preferences (Green et al., 2024).

Some of the aspects in which Learning Flexibility is manifested in blended learning are 1) Time flexibility. Students can choose when to study online, giving them control over their schedule. This allows learning to occur outside designated school hours while using face-to-face time in class for more interactive discussions or activities. 2) Flexibility of the place. Online learning in a blended model allows students to learn from any location as long as they are connected to the internet. This reduces physical attachment to the classroom and allows students to learn in a comfortable and productive environment. This approach allows students to learn the material at their own pace, slowing down when they need a deeper understanding or speeding through concepts they already understand. This is important because each student has a different learning rhythm. 4) Flexibility of Content and Learning Techniques. Students can determine the specific learning material or activity that best suits their learning style and choose various learning resources, ranging from videos and articles to participating in discussion forums. 5) Flexibility in Evaluation and Assessment. Mixed learning can also provide various forms of evaluation that assess student progress. These systems can include repeatable formative tests, project-based performance assessments, and mandir assessments (Moskalenko et al., 2024).

Learning Flexibility in blended learning significantly promotes personalized learning, where students can tailor their learning experience for optimal learning outcomes. Thus, this approach increases student engagement and motivation and the potential for academic achievement. For maximum flexibility, careful learning design and adequate technological support are required.

Students' reactions to flexibility in blended learning can vary depending on various factors, including the student's personal characteristics, educational background, learning preferences, and the quality of the implementation of Blended learning itself. In general, some of the reactions that can be observed include 1) Increased Motivation and Engagement. Students often feel more motivated and engaged when they can control some aspects of their learning process. Flexibility in blended learning can make students more eager to learn because they feel they have a greater responsibility for their education. 2) Better adaptation. Students with special needs or who have busy personal schedules (e.g., athletes or employees) will respond positively to flexibility because blended learning allows them to adapt to their circumstances. 3) Improvement of learning outcomes. When students can learn at their own pace, they can often understand the material better, reflecting improved learning outcomes.

Students can spend more time on difficult subjects and go through the sections they are already good at faster. 4) Time management difficulties. Sometimes, flexibility in blended learning can cause some students to have difficulty managing their time and prioritizing tasks. Students can fall behind in their studies if they do not have good organizational skills. Students unfamiliar with technology or lack access to technological resources may experience stress or anxiety, which can hinder their blended learning experience. 6) Feeling lonely. In some cases, students may feel more isolated due to the lack of face-to-face interaction, which can negatively impact their social and emotional well-being and reduce opportunities for collaboration and communication with peers and educators. 7) Increase independence. Some students may respond in a very positive way, developing independence and lifelong learning skills, as they must take initiative in their learning process (Jayarathna & Herath, 2024; Morton et al., 2016)

In an educational context, it is important to provide adequate orientation and guidance to students on effectively utilizing flexibility in blended learning, including developing timing skills, self-study strategies, and access support when needed. Careful application and continuous monitoring of student learning experiences are essential to optimize the benefits of blended learning for all student participants (Cao, 2023).

Thus, students' responses to flexibility in blended learning vary and are influenced by many factors. That doesn't mean one method is much better than the other. Instead, the best approach usually involves a combination of different learning methods. When blended learning methods are applied effectively, this flexibility can be a powerful tool to help students learn in a way that makes more sense to them. On the other hand, if not done correctly, it can be challenging and stressful for students, especially those who lack learning discipline and access to technological resources (Cao, 2023).

Good communication and ongoing assistance are essential in this process. Both teachers and students need a clear understanding of expectations and a variety of resources and support to solve any issues that may arise. It is also important to remember that all students are unique, with their own learning needs and preferences. An approach that works well for one student may not be as effective as another. Therefore, the choice of learning methods must remain flexible and responsive to students' individual needs (Lancaster, 2022; Pham & Vu, 2024).

4. CONCLUSION

Technology can increase student engagement, facilitate access to a wider range of learning activities, and improve learning outcomes through more interactive and flexible methods. When strategically integrated into the learning process, technology improves teaching efficiency and prepares students with the skills needed for the digital age. The implications of these findings are important for education stakeholders in designing and implementing teaching practices that harness the potential of technology to improve the learning process in the classroom. Further research is suggested to conduct empirical studies involving experiments in real classrooms to measure the direct impact of technology and blended learning approaches on student engagement and learning outcomes.

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